CLAIMS

Having thus described the preferred embodiments, the invention is now claimed to be:

1. A radiographic imaging system **(10)** comprising:

a means **(16)** for detecting emission radiation emitted by a radioisotope injected into a subject **(14)**, the detecting means **(16)** arranged around a circular bore **(18)**, the bore **(18)** having an entrance **(40)** and an exit **(42)**; and

a means **(38)** for shielding the detecting means **(16)** from the emission radiation originating outside of the bore **(18)**, the shielding means **(38)** including at least one rigid radiation opaque shield rigidly mounted to one of the entrance **(40)** and the exit **(42)** of the bore **(18)**, the shield extending from an outer periphery of the bore **(18)** toward and surrounding a central axis of the bore **(18)** and defining a fixed non-circular subject receiving aperture **(36)**.

2. The imaging system according to claim 1, wherein the aperture **(36)** of the at least one shield is elliptical.

3. The imaging system according to claim 2, wherein the elliptical aperture **(36)** has a horizontal major axis **(D1)** and a vertical minor axis **(D2)**.

4. The imaging system according to claim 3, wherein a ratio of the major axis **(D1)** to the minor axis **(D2)** is or about 7 to 5.

5. The imaging system according to claim 1, wherein the subject **(14)** is received in the aperture **(36)** on a subject support means **(12)** including:

a top surface **(60)**, on which the subject **(14)** is positioned;

a bottom surface **(52)** opposing the top surface **(58)**; and

a pair of side surfaces **(58)** opposing each other and each disposed between the bottom **(52)** and the top **(60)** surfaces.

6. The imaging system according to claim 5, wherein each shield **(38)** defines a bottom boundary **(50)** of the aperture **(36)** disposed underneath the subject support means **(12)**, which bottom boundary **(50)** of the aperture **(36)** conforms to a shape of the bottom surface **(50)** of the subject support means **(12)**.

7. The imaging system according to claim 6, wherein the subject support means **(12)** is vertically adjustable and no substantial air gap is defined between the aperture bottom boundary **(50)** and the bottom surface **(52)** of the subject support means **(12)** when the subject support means **(12)** is in a lower most position.

8. The imaging system according to claim 6, wherein each shield **(38)** defines a top curved boundary **(54)** of the aperture **(36)** disposed above the subject support means **(12)**.

9. The imaging system according to claim 8, wherein each shield **(38)** defines a pair of opposing side boundaries **(56)** of the aperture **(36)**, each side boundary **(56)** disposed between the bottom **(50)** and top **(54)** boundaries of the aperture **(36)**.

10. The imaging system according to claim 9, wherein the aperture side boundaries **(56)** are curved.

11. The imaging system according to claim 9, wherein the aperture side boundaries **(56)** include linear vertical surfaces, which conform to a path of vertical travel of the side surfaces **(58)** of the subject support means **(12)** and the subject **(14)**.

12. The imaging system according to claim 11, wherein there is no substantial air gap between each side boundary **(58)** of the aperture **(36)** and an associated side surface **(58)** of the subject support means **(12)**.

13. The imaging system according to claim 11, wherein there is no substantial air gap between side boundaries **(58)** of the aperture **(36)** and the subject **(14)**.

14. The imaging system according to claim 9, wherein:

the bottom boundary (50) of the aperture (36) is substantially parallel to the bottom surface (52) of the subject support means (12), and

each side boundary (56) of the aperture (36) is substantially parallel to an associated side surface (58) of the subject support means (12).

15. The imaging system according to claim 1, wherein:

at least one of the shields is a plate of radiation opaque material which is non-movably mounted about the bore.

16. The imaging system according to claim 1, wherein the emission radiation detecting means includes a plurality of detectors mounted around the circular bore and further including:

a coincidence detecting means (22) for determining when two of the detectors detect emitted radiation within a preselected temporal window of being simultaneous.

17. A method of radiographic imaging comprising:

detecting emission radiation emitted by a radioisotope injected into a subject (14) along a detecting means (16) defined around a circularly cylindrical bore (18); and

shielding the detecting means (16) from the emission radiation originating outside of the bore (18) with at least one shield rigidly mounted to one of an entrance and an exit of the bore and extending from an outer periphery of the bore toward and surrounding a central axis of the bore and defining a fixed non-circular subject receiving aperture (36).

18. A method of shielding a radiographic scanner, which has an elongated circular bore extending between first and second bore ends and surrounded by an array of radiation detectors, from radiation originating outside of the bore, the method comprising:

shaping a unitary piece of radiation opaque material into a one-piece shield with an outer periphery that closes one of the bore ends and a central non-circular aperture which mimics a cross section of a received subject; and

rigidly mounting the shield to the one bore end to permit a subject to be imaged in the scanner bore to pass into and out of the bore through the non-circular aperture.

19. The method according to claim 18, wherein the aperture **(36)** is elliptical.

20. The method according to claim 18, wherein the radiographic scanner includes a subject support **(12)**, which supports the subject in the bore and moves the subject longitudinally into and out of the bore through the non-circular aperture, the method further including:

shaping a bottom boundary **(50)** of the non-circular aperture to conform to a shape of a bottom surface of the subject support.

21. The method according to claim 20, further including:

shaping a top boundary **(54)** of the aperture disposed above the subject support means arcuately with a different curvature from the bottom boundary.

22. The method according to claim 20, wherein the subject support moves vertically to raise and lower the subject in the bore and further including:

shaping a pair of opposing side boundaries **(56)** of the aperture with linear and vertical regions to accommodate vertical movement of the subject support.

23. The method according to claim 18, further including:

positioning a subject on a subject support;

injecting the subject with a radiopharmaceutical;

moving the subject support to position a region of interest of the subject in an isocenter of the bore and other regions of the subject outside of the bore; and

detecting radiation from the radiopharmaceutical within the region of interest with the array of radiation detectors, while concurrently blocking radiation from the radiopharmaceutical in the regions of the subject outside the bore from reaching the radiation detectors with the radiation opaque shield.